EXHIBIT 23

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

TQ DELTA, LLC, *Plaintiff*, v. **COMMSCOPE HOLDING COMPANY, INC., COMMSCOPE INC., ARRIS INTERNATIONAL LIMITED, ARRIS GLOBAL LTD., ARRIS US HOLDINGS, INC., ARRIS SOLUTIONS, INC., ARRIS TECHNOLOGY, INC., and ARRIS ENTERPRISES, LLC,** *Defendants*.	CIV. A. NO. 2:21-CV-310-JRG (Lead Case)
TQ DELTA, LLC, *Plaintiff*, v. **NOKIA CORP., NOKIA SOLUTIONS AND NETWORKS OY, and NOKIA OF AMERICA CORP.,** *Defendants*.	CIV. A. NO. 2:21-CV-309-JRG (Member Case)
NOKIA OF AMERICA CORP., *Third-Party Plaintiff*, v. **BROADCOM CORP., BROADCOM INC., and AVAGO TECHNOLOGIES INTERNATIONAL SALES PTE. LTD.,** *Third-Party Defendants*.	

DECLARATION OF BRUCE MCNAIR
REGARDING CLAIM CONSTRUCTION

TABLE OF CONTENTS

I. INTRODUCTION

1. My name is Bruce McNair, and I have been retained as a technical expert by counsel for Defendants Nokia of America Corporation, Nokia Corporation, Nokia Solutions and Networks Oy (collectively, "Nokia") and CommScope Holding Company, Inc., CommScope Inc., ARRIS US Holdings, Inc., ARRIS Solutions, Inc., ARRIS Technology, Inc., and ARRIS Enterprises, LLC (collectively, "CommScope") (together, "Defendants") to address certain issues concerning U.S. Patent No. 7,570,686 (the "Family 1 Patent," or the "'686 Patent"), U.S. Patent No. 8,594,162 (the "'162 Patent"), U.S. Patent No. 10,567,112 (the "'112 Patent"), and U.S. Patent No. 8,462,835 (the "'835 Patent") (collectively, the "Family 6 Patents"), whichhave been asserted by TQ Delta, LLC ("Plaintiff" or "TQ Delta"). Unless otherwise stated, the matters contained in this declaration are of my own personal knowledge and, if called as a witness, I could and would testify competently and truthfully with regard to the matters set forth herein.

2. My opinions are based on my years of education, research and experience, as well as my investigation and study of relevant materials. A list of materials considered is included in **Appendix A** to my declaration.

3. I may rely upon these materials, my knowledge and experience, and/or additional materials, documents, and information in forming any opinions in this Action, including but not limited to opinions to rebut arguments raised by Plaintiff. I reserve all rights that I may have to supplement this declaration if further information becomes available or if I am asked to consider additional information. Furthermore, I reserve all rights that I may have to consider and comment on any additional expert statements or testimony of Plaintiff's experts in this matter.

4. My analysis of materials relevant to this Action is ongoing, and I may continue to review new material as it becomes available. This declaration represents only those opinions I

have formed to date. I reserve the right to revise, supplement, and/or amend my opinions stated herein based on new information and on my continuing analysis of the materials already provided. I also reserve the right to create exhibits to use in Court if called upon to testify.

5. I am being compensated at my usual consulting rate of $650 per hour for my time spent working on issues in this case. My compensation does not depend upon the outcome of this matter or the opinions I express.

II. QUALIFICATIONS

6. I have summarized in this section my educational background, industry experience, and other relevant qualifications. A true and accurate copy of my curriculum vitae is attached as **Exhibit B** to this declaration.

A. Education

7. I received my Bachelors of Engineering (Electrical) from Stevens Institute of Technology in 1971 and my Masters of Electrical Engineering from Stevens in 1974. I have taken numerous PhD-level courses in Electrical Engineering, Computer Engineering, and Computer Science at Stevens, as well.

B. Industry Experience

8. I was employed by the U.S. Army Electronics Command at Fort Monmouth, NJ, from 1971 to 1973 and 1974 to 1978 where I worked with voice, data, and wireless communications systems.

9. In 1973, I was employed by ITT Defense Communications Division in Nutley, NJ, where I designed digital hardware and computer software to investigate signal processing of speech signals and transmission of satellite communications signals using advanced forward error correction schemes.

10. From 1978 to 2002, I was employed by AT&T Bell Laboratories and AT&T Laboratories at various New Jersey locations. My work there involved public data networks, high-speed digital communications over analog networks, speech processing, network security, and wireless communications. Several of my positions were closely associated with the subject matter of asserted patents. In particular, while I was in the Bell Labs Data Communications Laboratory in the early 1980s, I worked on high-speed analog modems using techniques that others in the organization later applied to DSL signaling. John Cioffi, one of the inventors of cited prior art, was one of the other members of the group I was in. Rich Gitlin, who was the supervisor of that group and later the head of the same department, is the recognized inventor of the initial concept of DSL technologies for the local telephone plant. Later in my AT&T/Bell Labs career (1994-2002) I investigated the use of Orthogonal Frequency Division Multiplexing (OFDM) for wireless communications. OFDM forms the basis for DSL communications, although the characteristics of a wireless network environment make communications far more difficult than the relatively benign DSL environment. My research in OFDM for wireless applications included the use of interleaving, forward error correction, synchronization, and Reed-Solomon codes.

C. Publications

11. My list of publications is shown in my curriculum vitae, listed in **Exhibit B**, but I highlight a few that are closely related to the subject matter of the asserted patents: At VTC00, I presented results from an experimental implementation of OFDM in a wireless environment. I presented further results for this OFDM system at the Sarnoff Symposium in 2001. Seven more of my papers also relate to OFDM.

D. Prior Expert Testimony

12. A complete list of cases in which I have testified at trial, hearing, or by deposition

within the preceding five years is in **Exhibit C** to my declaration.

13. Based on my education and experience, I believe I am qualified to render the opinions set forth here.

III. SCOPE OF OPINIONS

14. I have been asked to provide opinions regarding the meaning of certain disputed claim terms as understood by one of ordinary skill at the time of the claimed inventions. My opinions are based on my understanding of the disputed claim terms and proposed construction and the evidence relied upon by the parties.

IV. LEGAL STANDARDS

15. Certain legal principles that relate to my opinions have been explained to me by counsel.

16. I understand that ultimately the Court will determine how specific terms shall be construed. The intent of this declaration is to help inform the Court how a person of ordinary skill in the art would have understood the meaning of certain disputed claim terms at the time of the claimed inventions in the context of the Asserted Patents' claims, specifications, and prosecution histories in a manner that will assist the Court in the process of construing the claims. I understand that patent claims are generally given the meaning that the terms would have to a person of ordinary skill in the art in question as of the earliest claimed priority date. It is my understanding that a patentee can act as its own lexicographer by defining a term, in the patent specification, to have specific meaning. It is my understanding that statements made to the patent office by the patentee or its legal representative during prosecution can serve to illuminate, or possibly narrow the proper scope of claim terms, and that such statements must be considered when construing the claim terms. This is sometimes referred to as disclaimer. I have

taken into account these principles in my analysis.

17. I understand that a claim is indefinite if, when read in light of the specification and its prosecution history, the claim fails to inform, with reasonable certainty, those skilled in the art about the scope of the claimed invention.

18. I understand that a patent may include both independent and dependent claims. I understand that a claim in dependent form must contain reference to a claim previously set forth and then specify a further limitation of the subject matter claimed. A claim in dependent form must be construed to incorporate by reference all the limitations of the claim on which it depends.

V. BACKGROUND

A. The Family 1 Patent

19. I have been asked to provide opinions regarding the meaning of certain claim terms in the '686 Patent.

20. The '686 Patent is titled "Systems and Methods for Establishing a Diagnostic Transmission Mode and Communicating Over the Same."

21. I understand that TQ Delta has asserted the following claims and priority dates:

Patent	Asserted Claims	Asserted Priority Date
'686 Patent	17, 18, 36, 37, 40	January 7, 2000, or, in the alternative, August 10, 2000, or, in the alternative, January 8, 2001.

22. I have been asked to assume the applicability of the priority date for this patent as detailed above and have therefore analyzed the claim constructions and knowledge of one of ordinary skill for the patent as of those dates.

23. Digital Subscriber Line (DSL) is a technology that developed from research into

analog modems in the early 1980s. As signal processing technology advanced while refinements in communications theory and error correction coding allowed higher and higher transmission speeds, it was recognized that there were two fundamental limitations to being able to send information at high speeds: noise and bandwidth. Transmission bandwidth limits the rate at which signals can be modified (modulated) while allowing reliable detection of the transmitted signals. Noise limits the number of distinct signal levels that can be reliably transmitted while allowing the receiver to reliably determine which particular signal was sent in a certain time slot. As my colleagues and I in the Bell Labs Digital Communications Laboratory, John Cioffi among them, researched techniques to send information at higher data rates, we recognized that there was a fundamental limit to transmission in the local loop (the transmission line between the customer premises and the central office), while long distance transmission had a different set of restrictions. The study of DSL recognized that, if the limitations in the local loop could be separated from the issues in the long distance network, higher-speed, reliable communications were possible. If the short-distance transmission through the local loop could be conquered, the evolving high-speed long-distance digital network could carry the high-speed transmission the rest of the way to the destination.

24. By the late 1980s to early 1990s, key aspects of Discrete Multi-Tone ("DMT") DSL had been developed by John Cioffi and his colleagues at Stanford and AT&T Bell Labs. Discrete multitone (DMT) had been deployed as a multi-carrier modulation scheme to allocate available spectrum for various DSL networks. The conventional DMT transceivers decompose the available frequencies/bandwidth into separate subchannels as specified by the recognized standards. This static infrastructure lead to an inefficient use of the available resources of the network when the transmitted traffic requires only part of the whole allocated spectrum. DMT

makes use of the available frequencies that can be transmitted on the telephone line and splits them into 256/512 equal sized frequency bins of 4.3125 kHz each. Sub-channels (or carrier bins) are where data bits are transmitted to and from our modem. Each sub-channel within a specific frequency range will be responsible for either upstream or downstream data.

25. By the time of the priority date of the Family 1 patents, multiple DSL standards had been developed and put into operation, including the T1.413-1995 and T1.413-1998 ADSL standards developed by the T1E1.4 committee of the American National Standards Institute (ANSI) and the ITU-T G.992.1 and G.992.3 ADSL and ADSL2 standards developed by SG15/Q4 of the ITU.

26. To enable a DSL service provider to monitor the health of an ongoing ADSL connection and troubleshoot issues, all of the ADSL standards in force as of the priority date of the ’686 patent specify mechanisms to retrieve, during Showtime, ADSL transceiver status information and performance monitoring parameters.

27. Specifically, each of the ADSL standards defines an embedded operations channel (EOC) to allow the ATU-C and ATU-R to communicate status information and performance monitoring parameters. T1.413-1995 at § 11.1; T1.413-1998 at § 8.1; G.992.1 at § 9.1; G.992.2 at § 8.1. Using the EOC, the ATU-C can send commands to the ATU-R to read from data registers the ATU-R maintains to store status information or performance-monitoring parameters. T1.413-1995 at § 11.1.3; T1.413-1998 at § 8.1.3; G.992.1 at § 9.2.3; G.992.2 at § 8.3.5. In response, the ATU-R sends the requested information using the EOC messaging protocol. T1.413-1995 at § 11.1.4.3.1; T1.413-1998 at § 8.1.5.3.1; G.992.1 at 9.2.5.3.1; G.992.2 at § 8.4. The EOC messaging protocol includes substantial redundancy to ensure that commands from the ATU-C and responses from the ATU-R are received correctly. *See, e.g.*, T1.413-1995 at

§ 11.1.4.3.1 (ATU-R repeats transmissions until ATU-C has received three consecutive and identical frames); T1.413-1998 at § 8.1.5.3.1 (same); G.992.1 at § 9.2.5.3.1 (same); G.992.2 at § 8.4.2.3 (same).

28. The '686 patent discloses systems and methods for exchanging diagnostic and test information between transceivers over a digital subscriber line. '686 patent at Abstract. FIG. 2 of the '686 patent, copied below, is a flowchart outlining an exemplary method for communicating diagnostic information according to the '686 patent. *Id.* at 3:12-15.

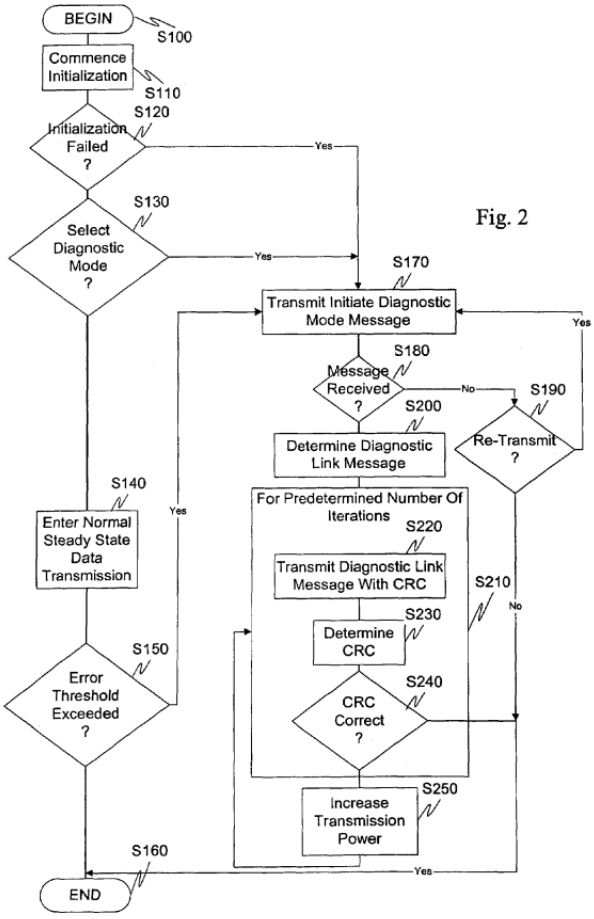

Fig. 2

29. The diagnostic and test information can include information about specific limitations of the modems, information relating to the modem installation and deployment environment, or other diagnostic and test information that can be determined as needed to help to

determine the cause of a failure or problem. *Id.* at 2:35-50. The diagnostic and test information can also include information "that has been assembled during, for example, the normal ADSL initialization procedure." *Id.* at 5:64-66. The '686 patent provides examples of diagnostic and test information, including the following in Table 1:

TABLE 1

Exemplary Message Variables
Data Sent in the Diag Link
Train Type
ADSL Standard
Chip Type
Vendor ID
Code Version
Average Reverb Received Signal
Programmable gain amplifier (PGA) Gain - Training
Programmable gain amplifier PGA Gain - Showtime
Filter Present during Idle Channel Calculation
Average Idle Channel Noise
Signal to Noise during Training
Signal to Noise during Showtime
Bits and Gains
Data Rate
Framing Mode
Margin
Reed-Solomon Coding Gain
QAM Usage
Frequency Domain Equalizer (FDQ) Coefficients
Gain Scale
Time domain equalizer (TDQ) Coefficients
Digital Echo Canceller (DEC) Coefficients

30. The remote terminal (RT) can send a data message containing data variables to the central office (CO). *Id.* at 4:25-35. As used herein, the RT is located at a subscriber residence and is referred to elsewhere in the '686 patent as an ATU-R, and the CO is located in a central location and is referred to as an ATU-C. The '686 patent discloses three ways in which the RT may send the diagnostic and test information: (a) by using a one-bit-per-DMT-symbol message encoding scheme "as is used in the C-Rates1 message in the ITU and ANSI ADSL standards," (b) by using "Differential Phase Shift Keying (DPSK) on a subset or all of the carriers, as specified in, for example, ITU standard G.994.1," or (c) by using "higher order QAM modulation (>1 bit per carrier)." *Id.* at 3:50-53. These methods are used due to their robust nature and ability to be transmitted in the presence of large amounts of noise and other disturbances. *Id.* at 3:54-67.

31. The '686 patent discloses that diagnostic and test information can be exchanged by the ATU-C and ATU-R during the normal steady-state communications mode, and during a "diagnostic link mode" that can be used "if the ATU-C and/or ATU-R modem fail to complete an initialization sequence, and are thus unable to enter a normal steady state communications mode, where the diagnostic and test information would normally be exchanged." Id. at 2:22-26. The diagnostic link mode allows the ATU-C and ATU-R to "exchange the diagnostic and test information that is, for example, used by a technician to determine the cause of a failure without the technician having to physically visit, i.e., a truckroll to, the remote site to collect data." *Id.* at 2:29-34. An asserted claim of the '686 patent is claim 17, which recites:

> An information storage media comprising instructions that when executed communicate diagnostic information over a communication channel using multicarrier modulation comprising:
>
> instructions that when executed direct a transceiver to receive or transmit an initiate diagnostic mode message; and
>
> instructions that when executed transmit a diagnostic message from the transceiver using multicarrier modulation, wherein the diagnostic message comprises a plurality of data variables representing the diagnostic information about the communication channel and each bit in the diagnostic message is mapped to at least one DMT symbol, and wherein one variable comprises an array representing frequency domain received idle channel noise information.

Id. at Claim 17.

B. The Family 6 Patents

32. I have been asked to provide opinions regarding the meaning of certain claim terms in the Family 6 Patents.

33. The Family 6 Patents are titled "Impulse Noise Management."

34. I understand that TQ Delta has asserted the following claims and priority dates:

Patent[1]	Asserted Claims	Asserted Priority Date
'162 Patent	8, 9, 11	January 7, 2000, or, in the alternative, August 10, 2000, or, in the alternative, January 8, 2001.
'112 Patent	8, 10, 11, 12, 14	March 3, 2004 or, in the alternative, March 24, 2004, or, in the alternative, March 3, 2005, or in the alternative, April 28, 2010, or, in the alternative, June 11, 2003
'835 Patent	8, 10, 24, 26	March 3, 2004 or, in the alternative, March 24, 2004, or, in the alternative, March 3, 2005, or in the alternative, April 28, 2010, or, in the alternative, June 11, 2003

35. I have been asked to assume the applicability of the priority dates for these patents as detailed above and have therefore analyzed the claim constructions and knowledge of one of ordinary skill for the patent as of those dates.

36. In forming the opinions set forth in this declaration, I have reviewed the asserted Family 6 Patents and their file histories.

37. The Family 6 Patents generally relate to impulse noise protection adaptation. '162 Patent at 1:23-24. The Family 6 Patents explain that "[c]ommunications systems often operate in environments that produce impulse noise. Impulse noise is a short-term burst of noise that is higher than the normal noise that typically exists in a communication channel." '162 Patent at 1:29-32. For example, DSL systems may encounter impulse noise. '162 Patent at 1:32-36. Impulse noise protection is managed through interleaving and Forward Error Correction (FEC), but as of the time of the Family 6 Patents, the "current xDSL procedure at least [did] not provide

[1] The '162 Patent is only asserted against Nokia. The '835 Patent is only asserted against CommScope. The '112 Patent is asserted against both Nokia and CommScope.

specific states to enable training for the selection of the appropriate interleaving and FEC parameters." '162 Patent at 1:42-46.

38. At the time of the Family 6 Patents, the "current technique" for selecting interleaving and FEC parameters "include[d] the steps of an operator . . . configuring the ADSL connection with a specific noise protection value, the ADSL connection [being] initialized and the transceivers enter[ing] into steady state data transmission (i.e., Showtime), and if the connection is stable, i.e., error-free, then the service is acceptable and the process ends." '162 Patent at 2:41-47. But "if there are bit errors, then the process is repeated with the operator . . . configuring the ADSL connection with another specific INP value." '162 Patent at 2:47-49.

39. The Family 6 Patents describe that the system of the alleged invention can transition from one "FEC and Interleaving Parameter (FIP) setting" "to another FIP setting without going through the startup initialization procedure such as the startup initialization sequence utilized in traditional xDSL systems." '162 Patent at 3:30-44.

40. With respect to the background of the invention, I reserve the right to respond to TQ Delta's expert's description should a more detailed description of the background of the technology become necessary.

VI. LEVEL OF ORDINARY SKILL IN THE ART

41. I have been asked to offer my opinion regarding the level of ordinary skill in the art with respect to each of the Asserted Patents.

42. In my opinion, with regard to the '686 patent, a person having ordinary skill in the art at the time of the alleged inventions of the Asserted Patents would have possessed a bachelor's degree in electrical or computer engineering, or the equivalent, and at least 5–6 years of experience in telecommunications or a related field; a master's degree in electrical or

computer engineering, or the equivalent, and at least 2–3 years of experience in telecommunications or a related field; or a Ph.D. in electrical or computer engineering, or the equivalent, with at least 1–2 years of experience in telecommunications or a related field. As of the time of the invention of the various patents through the present, I qualify as a person of ordinary skill in the art.

VII. DISPUTED CLAIM TERMS

43. I have been asked to provide opinions as to the terms and issues identified below and the claims associated with those terms.

A. Family 1 Patent

1. "each bit in the diagnostic message is mapped to [at least one / one] DMT symbol"

Claim(s)	Plaintiff's Position	Defendants' Position
'686 Patent, Claims 17, 36, 40	Plain and ordinary meaning. No construction necessary.	Indefinite

44. I understand that the parties dispute the construction of "each bit in the diagnostic message is mapped to [at least one / one] DMT symbol," which is in the above-listed claims of the '686 Patent. I understand that the Plaintiff contends that this term should be afforded its "[p]lain and ordinary meaning. No construction necessary." Having considered the parties' positions, I agree with Defendants' position.

45. This term is indefinite. Indeed, a person of ordinary skill in the art would not understand the meaning of the phrases "mapped" or "at least one" / "one" as used in the asserted limitation.

46. As an initial matter, the term "mapped" is a jargon term that would not provide a person of skill in the art with reasonable certainty as to what is intended by this phrase in the

context of the claim. Specifically, the term "mapped" could mean that the same bit value is represented by one symbol, two symbols, or every symbol that results from a given DMT signal. A person of skill in the art would understand that you have to define a mapping function with specificity in order to implement that particular function.

47. The specification contains a single description of the term "mapped." The specification discloses "[i]n the one bit per DMT symbol modulation message encoding scheme, a bit with value 0 is mapped to the REVERB1 signal and a bit with a value of l mapped to a SEGUE1 signal." '686 patent at col. 3:54-57. But the language used in the specification references mapping to a particular *signal*, not a symbol, and provides no insight as to what it means to map a bit of the diagnostic message to a symbol.

48. Further, this disclosure of mapping does not tell us anything about mapping a bit of the *diagnostic message*. The REVERB1 and SEGUE1 signals are instead only relevant to the state of the communication protocol, and are not part of the diagnostic message.

49. Next, the phrases "at least one" and "one" are both indefinite as they are used in the claims. While "one" is clear, the term "at least one" allows for the scenario that a given bit is mapped to more than one DMT signal. As described below, the different possible interpretations tied to each version of the claim further adds to the indefinite nature of the term.

50. With respect to "at least one," a person of ordinary skill in the art would not understand how a bit in a message could be "mapped" to more than one DMT symbol. Indeed, as described above, the discussion within the specification of the "one bit per DMT symbol modulation scheme," '686 patent at 3:54-67, does not disclose that any particular bit is mapped to *more* than one DMT *symbol*. The claim language would raise a number of questions in the mind of one of ordinary skill in the art. For example, a person of skill in the art may question 1)

whether there is some error coding used to map a bit into several redundant symbols, 2) whether the same bit is sent multiple times, once in each symbol, or 3) whether the claim language contemplates something else entirely.

51. With respect to "one," were a person of ordinary skill in the art to, in the alternative, interpret "one DMT symbol" to refer to the transmission of a bit, they would not understand how a bit, when transmitted, is transmitted for only one DMT symbol period. A person of ordinary skill in the art would understand that a DMT symbol includes transmission at multiple frequencies. It is not clear how a bit of data would be mapped to all of the subcarriers of a symbol. Stated differently, the symbol could consist of multiple subcarriers and a person of ordinary skill would not know how and to which of the subcarriers the data is mapped.

52. A person having ordinary skill at the time of the alleged invention would have been familiar with and understood the G.992.1 Recommendation. G.992.1 consistently states that signals, including the initialization signals using REVERB1 and SEGUE1, span multiple DMT symbol periods—and requires that any signals that are limited in duration be expressly defined as limited in duration. For example, section 10.1.1 of G.992.1 states:

> The description of a signal will consist of three parts:
>
> * * *
>
> The second is a statement of the required duration, expressed in DMT symbol periods, of the signal. This signal duration may be a constant or may depend upon the detected signaling state of the far-end transceiver. The duration of a single DMT symbol period depends on whether the cyclic prefix is being used; some initialization signals contain a cyclic prefix, and some do not. ATU-C signals up to and including C-SEGUE1 are transmitted without a cyclic prefix; those from C-RATES1 on are transmitted with a prefix. Similarly, ATU-R signals up to and including R-SEGUE1 do not use a prefix; those from R-REVERB3 onward do. The duration of any signal in seconds is therefore the defined number of DMT symbol periods times the duration of the DMT symbol being used.

ITU-T Recommendation G.992.1 at § 10.1.1 (emphasis added). Section 10.4.5 describes the signal C-REVERB1, which is transmitted by the ATU-C:

> C-REVERB1 is a signal that allows the ATU-C and ATU-R receiver to adjust its automatic gain control (AGC) to an appropriate level. . . . The duration of C-REVERB1 is 512 (repeating) symbols without cyclic prefix.

G.992.1 at § 10.4.5 (emphasis added). Thus, the signal C-REVERB1 spans 512 DMT symbol periods. Section 10.5.2 describes the signal R-REVERB1, which is transmitted by the ATU-R:

> R-REVERB1 is a periodic signal, without cyclic prefix, that is transmitted consecutively for 4096 symbols.

G.992.1 at § 10.5.2 (emphasis added). Thus, R-REVERB1 spans 4096 DMT symbol periods, not only a single symbol period.

53. Likewise, G.992.1 states explicitly that the SEGUE1 signal is never limited to one DMT symbol period. Section 10.6.1 states that "[t]he duration of C-SEGUE1 is 10 (repeating) symbol periods," and section 10.7.1 states that "[t]he duration of R-SEGUE1 is 10-symbol periods," which means that neither SEGUE1 signal is limited in time to a single DMT symbol period. *See* G.992.1, §§ 10.6.1, 10.7.1.

54. Furthermore, '686 patent states that "the Average Reverb Signal contains the power levels per tone, up to, for example, 256 entries, detected during the ADSL Reverb signal." '686 patent at col. 4:31-33. As would have been recognized by a person having ordinary skill in the art at the time of the alleged invention, and as explained above, the ADSL REVERB signal has a duration that far exceeds the single DMT symbol period.

55. The claims use of both "at least one" and "one" in different independent claims of the '686 patent further adds the ambiguity of what was intended by this claim term.

56. The prosecution history also does not provide any insight as to what is intended by the limitation "each bit in the diagnostic message is mapped to [at least one / one] DMT

symbol." In an attempt to overcome the prior art, the patent owner simply added this language without any explanation as to its intended meaning. *See* '686 File History, January 12, 2007 Amendment and Remarks.

57. For these reasons, I am of the opinion that this claim limitation is indefinite.

B. Family 6 Patents

1. "FIP setting," "FIP value," and "interleaver parameter value"

"FIP setting"		
Claim(s)	**Plaintiff's Position**	**Defendants' Position**
'835 Patent, Claims 8, 10, 24, 26 '112 Patent, Claim 8	Plain and ordinary meaning. No construction necessary.	forward error correction and interleaver parameters characterized by the set of parameters for codeword size in bytes, number of information bytes in a codeword, number of parity or redundancy bytes in a codeword, and interleaver depth in number of codewords

"FIP value"		
Claim(s)	**Plaintiff's Position**	**Defendants' Position**
'835 Patent, Claims 8, 24	Plain and ordinary meaning. No construction necessary.	numerical value of codeword size in bytes, number of information bytes in a codeword, number of parity or redundancy bytes in a codeword, or interleaver depth in number of codewords

"interleaver parameter value"		
Claim(s)	**Plaintiff's Position**	**Defendants' Position**
'835 Patent, Claims 10, 26 '162 Patent, Claim 8	Plain and ordinary meaning. No construction necessary.	the numerical value of the interleaver depth in number of codewords

I understand that the parties dispute the constructions of "FIP setting," "FIP value," and "interleaver parameter value" which are in the above-listed claims of the Family 6 Patents. I

understand that the Plaintiff contends that these terms should be afforded their "[p]lain and ordinary meaning. No construction necessary." It is my opinion that the terms "FIP setting," "FIP value," and "interleaver parameter value" were not terms of art at the time of the alleged invention and did not have a generally understood meaning.

58. The Family 6 Patents define the initialism "FIP" as "FEC and Interleaving Parameter." '162 Patent at 3:33-36. While a person of ordinary skill in the art would have generally understood that the processes of forward error correction encoding and interleaving are usually governed by certain parameters, a person of ordinary skill in the art would have been unfamiliar with the particular initialism "FIP" as used in the Family 6 Patents. For example, I had not seen the term "FIP" used to refer to FEC and interleaving parameters before I read the Family 6 Patents. Because the Family 6 Patents specially define the term "FIP," a person of ordinary skill in the art would have understood the Family 6 Patents to be referring to particular FEC and interleaving parameters as explained in the Family 6 Patents.

59. A person of ordinary skill in the art would accordingly look to the specification of the Family 6 Patents to understand the scope of the terms "FIP setting," "FIP value," and "interleaver parameter value." Although there may be many parameters relevant to the processes of FEC encoding and interleaving, the Family 6 Patents specify four particular parameters when discussing the "FIP settings" and "FIP values." In particular, the Family 6 Patents describe the set of parameters as codeword size in bytes, number of information bytes in a codeword, number of parity or redundancy bytes in a codeword, and interleaver depth in number of codewords. *See, e.g.*, '162 Patent at 2:10-22, 3:33-49, 13:43-47.

60. A person of ordinary skill in the art would have further understood that there may be many potential "interleaver parameter values" and that there are many ways that one could

interleave a set of bits. A person of ordinary skill in the art therefore would not understand the term to generally have a well-defined meaning outside the context of the Family 6 Patents.

61. Accordingly, a person of ordinary skill in the art would have looked to the specification of the Family 6 patents to understand the term "interleaver parameter value." A person of ordinary skill in the art would have then understood that, among the defined FIP values, the value relevant to an interleaver parameter value is a numerical value associated with interleaver depth, which as defined in the Family 6 Patents is "interleaver depth in number of codewords." *See, e.g.*, '162 Patent at 2:10-22, 3:33-49, 13:43-47. The Family 6 Patents define no other units for interleaver depth other than codewords.

62. For these reasons, it is my opinion that "FIP setting," "FIP value," and "interleaver parameter value" were not terms of art at the time of the alleged invention and did not have generally understood meanings.

I declare under penalty of perjury that the foregoing is true and correct. Executed this 14th day of March, 2022.

Bruce McNair

APPENDIX A

List of Materials Considered

- U.S. Patent No. 7,570,686
- U.S. Patent No. 8,594,162
- U.S. Patent No. 10,567,112
- U.S. Patent No. 8,462,835
- File History of U.S. Patent No. 7,570,686
- File History of U.S. Patent No. 8,594,162
- File History of U.S. Patent No. 10,567,112
- File History of U.S. Patent No. 8,462,835
- 2002 McGraw-Hill Dictionary of Scientific and Technical Terms definition of "map" and "mapping"
- Wikipedia.com definition of "map": This terminology is not completely fixed, as these terms are generally not formally defined, and can be considered to be jargon.
- Google definition of "mapped": "associate (a group of elements or qualities) with an equivalent group, according to a particular formula or model"
- ITU-T G.993.2 VDSL2 Standard
- ITU-T G.992.1 ADSL Standard

Exhibit A

Bruce McNair

1 Iron Hill Drive
Holmdel, NJ 07733
bmcnair@novidesic.com
1-732-264-5244

Career Summary

- Fifty years engineering research, design, development, systems engineering experience in communications systems (including extensive background in wireless communications and system/network security)
- Twenty four years as a well-rated member of one of world's most highly respected R&D organizations, recognized for breadth, depth and practicality of expertise
- Extensive experience teaching technical short courses for premiere educational programs over a fourteen year period
- Full time university educator for fifteen years with experience teaching a broad set of courses focusing on practical engineering approach
- On-line university educator for eighteen years teaching well-attended graduate courses in wireless and security technologies

Research interests

- High speed wireless data networking
- System/network security
- Geolocation technology
- Real-time digital signal processing
- Software-Defined Radio technology
- Broadband Powerline (BPL) technology

Present Organizations

- Stevens Institute of Technology,
- Novidesic Communications, LLC

Job Titles

- Distinguished Service Professor of Electrical and Computer Engineering
- Founder, Chief Technology Officer

Education

- M.E., E.E., Stevens Institute of Technology, 1974
- B.E. (with Honor), Stevens Institute of Technology, 1971
- Completed qualifiers and course work for PhD in Computer Science at Stevens

Relevant Experience

January 2003 – present – on-line teaching professor – Electrical and Computer Engineering, Stevens Institute of Technology, Hoboken, NJ;
Teach several well-enrolled on-line graduate courses in wireless security, information systems security and physical design of wireless communications systems.

August 2002 – December 2017 (retired) – Distinguished Service Professor of Electrical and Computer Engineering, Program Director, Computer Engineering graduate program, Stevens Institute of Technology, Hoboken, NJ;
Design and manage the Senior Design Project, a two-semester program that forms a substantial portion of the senior year in the engineering program. This project comprises a large fraction of the seniors' efforts and serves to provide real-world engineering design experiences for the student. Teach a large number of well-enrolled graduate and undergraduate core and elective courses. Conduct research in wireless systems, geolocation services, and broadband powerline (BPL) systems, particularly security needs and solutions. Member of Stevens Intellectual Property Review Board, Stevens Honor Board Advisory Council, Stevens' Schaeffer School of Engineering and Science Promotion and Tenure Committee, and the Senior Design Coordinator Committee.

February 2002 – present – CTO, Novidesic Communications, LLC, Holmdel, NJ;
Founded a technical consulting company, providing expert witness support and testimony, telecommunications, wireless networking, security, software, computing, product evaluation, proof-of-concept prototyping, and web site design guidance to individuals and small businesses. Clients include health care facilities, patent attorneys, major telecommunications providers, venture capitalists, major component manufacturing company, start-up hardware and concept development companies. Supported technology needs of small local business leading to Phase I and Phase II SBIR funding in the area of RFID with patented technology. Provide IP portfolio evaluation. Expert witness in patent litigation with experience testifying at deposition and trial as well as preparing USPTO IPR declarations.

August 2011 – February 2012 – Part-time consultant, Lockheed-Martin, Moorestown, NJ;
Support development of advanced radar systems and interactions with other wireless systems.

2010 – 2015 (part-time, on an as-needed basis) – Senior Systems Engineer consultant, AT&T Government Solutions, Columbia, MD;
Support AT&T's projects with the US Government customers on defense and intelligence-related systems, drawing on previous knowledge and experience in signal processing, wireless systems, telephone and computer networks, and secure system design.

Relevant Experience (continued)

May 1994 to February 2002 (retired) -- Wireless Systems Research Department, AT&T Bell Labs/ AT&T Labs - Research, Holmdel/Red Bank/Middletown, NJ
Member of Technical Staff/Research Staff Member/Principal Technical Staff Member/Technology Consultant; Investigating high-speed, high-mobility wireless data communications systems for untethered access to high speed global networks. Proposed and investigated IEEE 802.11(a & b) physical and MAC layer extensions to outdoor, high mobility environment. Efforts involved system architecture, system control, real-time DSP programming in C, high-speed hardware design, RF design, analog, RF interfacing, Matlab/SIMULINK simulation and experimental investigations. Responsible for complete design, implementation and characterization of a multiple TMS320C40-based 384 kb/s OFDM transmission system and definition/design of advanced signal processing platforms. Recent research extended results to 5-40 Mb/s with TMS320C62/FPGA-based platform and incorporated 802.11a and DVB-T technology. Previous research involved speech quality/data rate enhancements to IS-136, the North American TDMA cellular standard.

November 1987 to April 1994 -- Security and System Reliability Architecture Group, AT&T Bell Labs, Holmdel, NJ
Technical Manager; Created, staffed, and led a group of security, systems reliability and fraud control experts to assess security/quality of products, services, operations systems, communications networks, operating systems, and work centers and to recommend, specify, and prototype cost effective improvements. Created corporate process to build security into the development process. Transformed small (2 person) corporate-funded activity into well-staffed (multi million dollar), successful business unit supported program. Served as security technologies subject matter expert for AT&T Corporate Security and other (AT&T and outside) organizations

May 1982 to October 1987 -- various AT&T Bell Labs organizations, MTS - Supervisor; System Design, Exploratory Development, Applied Research, and Final Product Development of secure voice terminals, modems, speech recognition and speaker verification systems, security chips, encryption devices, and network management systems

June 1978 to April 1982 -- various AT&T Bell Labs organizations, Member of Technical Staff, System design, digital hardware design and simulation of wide area (X.25) data communications networks and high-speed data transmission techniques for voiceband modems. Led $1M IR&D secure voice terminal initiative, ultimately resulting in promotion to MTS-Supervisor and laying groundwork for AT&T's breakthrough success in NSA’s STU-3 program.

Relevant Experience (continued)

June 1971 to February 1973, January 1974 to June 1978 -- U.S Army Communications R&D Command, Fort Monmouth, NJ. GS-7, 9, 11 & 12 Electronic Engineer (GS-0855)
Development of tactical military radio communications equipment, specializing in modulation, data transmission, communications security and electronic warfare (frequency hopping and direct sequence spread spectrum) for the SINCGARS VHF-FM radio system.

March 1973 to December 1973 -- ITT Defense Communications Division, Nutley, NJ.
Junior Member of Technical Staff; Designed, developed and tested software and digital hardware for portable satellite terminals for use by White House and the world's first hardware implementation of a 2400 bps Linear Predictive Coder (LPC) secure speech transmission system.

Patents, Presentations and Publications

Twenty six U.S. patents and nineteen international patents granted (several pending) in areas such as data transmission, cryptographic techniques, speech processing, video processing, security systems, user authentication, fraud control, synchronization, dynamic channel assignment, localization techniques, hazardous voltage detection, RFID, biomedical applications, vibration energy harvesting, solar energy harvesting for portable devices, etc.

Presented numerous well-rated short courses in Digital Communications, Digital Telephony, Digital Signal Processing, and Wireless Communications, & Security. Course sponsors included: Bell Labs In-hours Continuing Education Program, George Washington University, University of Maryland, UCLA Extension, Johns Hopkins University – Organizational Effectiveness Institute, Berlin (Germany) Continuing Engineering Education Program, Monmouth University, and the Fort Monmouth Education Center.

Several papers presented at IEEE Vehicular Technology and other Conferences and published in AT&T Technical Journal, IEEE Transactions on Wireless Communications, and IEEE Communications Magazine on various topics in wireless systems and security.

Skills

System/network architecture, communications system design, digital hardware design, RF design, signal processing, real-time DSP programming, software design and coding, proof-of-concept prototyping, designing and conducting laboratory research experiments, OFDM, TDMA/IS-136, FPGA, encryption, computer network security, threat assessment, data communications protocols, computer architecture, digital and analog video systems, system & link-level simulation, UNIX/Linux, Windows, C/C++, Matlab/Simulink, MathCad, PASCAL, Algol, SNOBOL, Verilog, VHDL, FORTRAN. Recruitment, development and management of highly effective technical staff. Highly effective technical presentations and training sessions to any level audience. Well-developed technical writing skills. Preparation, deposition, and testifying regarding expert report for patent infringement/non-infringement/validity/invalidity and other litigation matters. Assist in claim construction and prior art research for patent litigation.

Other information

U.S Citizen. Held Top Secret - Sensitive Compartmented Information (TS/SCI) clearance with full scope polygraph until October 2015.

Selected as one of twenty-six finalists among 490 entrants in the 2014 Bell Labs Prize competition for proposal “High-precision, low-cost, low-power indoor geolocation techniques.”

Stevens Institute of Technology, Henry Morton Distinguished Teaching Professor, 2013-2014.

Named to New Jersey Inventors Hall of Fame, Inventor of the Year (2012) for “Patented/Innovative Research and Entrepreneurial Leadership Related to: Groundbreaking modem development and next generation wireless data communications systems”

Mentored two AT&T Labs Fellowship Program (ALFP) participants, three students in the MentorNet program, 5 Bell Labs Early Career Advisory Program (ECAP) participants, numerous summer students (graduate and undergraduate), several new employees, and all of the staff in groups I have managed.

Advised a significant fraction of ECE Senior Design groups, numerous graduate students; participation in thesis committees of several Stevens PhD students in various departments, including Physics, Computer Science, Mechanical Engineering, and ECE. Consult with non-ECE students on ECE aspects of their Senior Design projects

Mentor summer students at Stevens in NSF-funded Research Experience for Undergraduates (co-PI).

Stevens Institute of Technology, Schaefer School of Engineering, Undergraduate Teaching Award, December 2006.

Life Senior Member, Institute of Electrical and Electronic Engineers - Member of Communications, Signal Processing, Computer and Education Societies

Member, American Society for Engineering Education

Secretary, IEEE Communications Society Communications Security Committee

Identified by Rutberg & Co. Investment Bankers (San Francisco) as member of a group of 213 “Top Wireless Influencers: 2002”

Member of the Council of Communications Advisors

Amateur radio operator licensed since 1963, Amateur Extra Class since 1970

Contact Information

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(732) 264-5244
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http://www.novidesic.com

US Patents

- “Liquid Crystal Display using the photovoltaic behavior of LED backlights as a source of electrical energy.” US Patent #10,310,326, June 4, 2019.
- “Method and apparatus for locating and distinguishing blood vessel.” US Patent #8,764,663, July 1, 2014.
- “Secure IP access protocol framework and supporting network architecture,” US Patent #8,046,577, October 25, 2011.
- “Method for Estimating Time and Frequency Offset in OFDM Systems,” US Patent #7,990,839, August 2, 2011.
- “Simulcasting OFDM system having mobile station location identification,” US Patent 7,962,162, June 14, 2011.
- “RFID Devices for Verification of Correctness, Reliability, Functionality and Security,” US Patent 7,712,674, May 11, 2010.
- ““Dynamic Channel Assignment,” US Patent 7,457,259, November 25, 2008.
- ““RFIDs Embedded into Semiconductors,” US Patent 7,348,887, March 25, 2008.
- “Method for Estimating Time and Frequency Offset in OFDM Systems,” US Patent #7,310,302, December 18, 2007.
- “Mobile Device Having Network Interface Selection,” US Patent #7,180,876, February 20, 2007.
- "Dynamic Channel Assignment," US Patent #6,954,465, October 11, 2005.
- “Method for Estimating Time and Frequency Offset in OFDM Systems,” US Patent #6,891,792, May 10, 2005.
- "Security System Providing Lockout for Invalid Access Attempts," US Patent #5,559,505, September 24, 1996.
- "Telecommunications Fraud Detection Scheme," US Patent #5,504,810, April 2, 1996.
- "Authenticator Card and System," US Patent #5,450,491, September 12, 1995.
- "Secure Telecommunications," US Patent #5,392,357, February 21, 1995.
- "Data Message Storage and Pickup Service,” US Patent #5,392,336, February 21, 1995.
- "System and Method for Granting Access to a Resource," US Patent #5,375,244, December 20, 1994.
- "Secure Teleconferencing," US Patent #5,353,351, October 4, 1994.
- "Method and Apparatus for Processor Based Encryption," US Patent #5,278,905, January 11, 1994.
- "Centralized Security Control System," US Patent # 5,276,444, January 4, 1994.
- "Technique for Voice Based Security System," US Patent #5,265,191, November 23, 1993.

US Patents (continued)

- "Video Scrambling System", US Patent # 5,206,906, April 27, 1993.
- "Cryptographic Transmission System," US Patent #4,642,424, February 10, 1987.
- "Processing of Encrypted Voice Signals," US Patent #4,608,455, August 26, 1986.
- "Control of Coefficient Drift for Fractionally Spaced Equalizers," US Patent #4,376,308, March 8, 1983

Several other published and unpublished US patents pending

International Patents

- “Voltage-controlled apparatus for battery-powered electronic devices,” EP Patent #0568237 B1, January 23, 2002.
- “A Dynamic Channel Assignment,” EP Patent #1,137,299, September 26, 2001.
- “Data Message Storage and Pickup Service,” EP Patent #0626776 B1, April 7, 1999.
- “Data Message Storage and Pickup,” Canadian Patent #CA-2119227A1, February 24, 1998.
- “Centralized Security Control System,” Canadian Patent #CA-2078077, January 27, 1998.
- “Improved centralized security control system and method,” EP Patent #0534679. August 12, 1997.
- “Authenticator Card with Changing Bar Code Pattern,” EP Patent #0,715,789, June 12, 1996.
- “Technique for voice-based security systems,” Canadian Patent #CA-2072172, April 30, 1996.
- “Method and apparatus for user identification and verification of data packets in a wireless communications network,” EP Patent #0,689,316, December 27, 1995.
- “Central Difference Control System,” Japanese Patent #1995-131526, May 19, 1995.
- “Authenticator Card with Changing Bar Code Pattern,” WO Patent #1995/006371, March 2, 1995.
- “Method for safety system of voice base and device therefore,” Japanese Patent #1995-049696, February 21, 1995.
- “Data message storage and pick up service, EP Patent #0,626,776, November 30, 1994.
- “Method for safety system of voice base and device therefore,” Japanese Patent #1995-049696, February 21, 1995.
- “Data message storage and pick up service, EP Patent #0,626,776, November 30, 1994.
- “Apparatus for battery type electronic device,” Japanese Patent #1994-138983, May 20, 1994.
- “Method and system for making communication via exchange network available, method for providing,” Japanese Patent #1994-085811, March 25, 1994.

International Patent (continued)

- Voltage-controlled apparatus for battery-powered electronic devices," EP Patent #0,568,237, November 3, 1993
- "Security node in switched telecommunication network", EP Patent #0,553,553, August 4,1993.
- "Improved centralized security control system and method," EP Patent 0,534,679, March 31, 1993.
- "An improved technique for voice-based security systems," EP Patent #0,533,396, March 24, 1993.
- "Cryptographic Transmission System," Canadian Patent #CA-1223932, July 7, 1987.

Several other published and non-published applications pending.

Journal Publications

- Leung,K., Clark,M.V., McNair,B., Kostic,Z., Cimini,L.J., Winters,J.H., "Outdoor IEEE 802.11 Cellular Networks: Radio and MAC Design and Their Performance", *IEEE Transactions on Vehicular Technology*, Vol. 56, No. 5, pp. 2673-2684, September 2007.
- Chuang, J., Cimini, L., Li, G., Lin, L., McNair, B., Sollenberger, N., Suzuki, M., Zhao, H., "High Speed wireless data access based on combining EDGE with wideband OFDM," *IEEE Communication Magazine*, November, 1999.
- D'Angelo, D.M., McNair, B., Wilkes, J.E., "Security in Electronic Messaging Systems," *AT&T Technical Journal*, Volume 73, Number 3, 1994.

Research awards

- "Standalone/Networked Compact, Low Power, Image-fused Multi-Spectrum Sensor System for Target Acquisition, Tracking and Fire Control," ARDEC, $2365000, co-PI with Victor Lawrence, Hong Man. AY2008-2009
- NSF: "REU Site: Integrated Software Radio and Radio Frequency Test Bed for Wireless Research in Dynamic Spectrum Access"; $296,754; NSF; Co-PI with Yu-Dong Yao. AY2004-2005
- AT&T Labs-Research Equipment donation of $900k DSP systems and wireless test equipment. AY2003-2004
- AT&T Labs-Research - $60k grant for "Investigation of Broadband Powerline technology" AY2003-2004

Masters theses supervised

- Xiongwei Xu, "The synchronization of IEEE 802.11A System", May 2014.
- Abdurazak Fathalla, "Security of Cloud Computing," May 2011.
- Tejas Marathe, "Comprehensive Performance Criteria for Wi-Fi Location Systems," December 2008.

Masters theses supervised (continued)

- Milin Patel, “Network Performance Enhancement using QoS, TCP Optimization, Application Acceleration and Dynamic Resource Allocation Techniques,” January 2008.
- Leo Gerard Raj, “Security in 4G Wireless Systems,” May 2005.

PhD committees

- Chao Tian, “Realization of Pure AM/FM Modulation via Combined Optical and Electrical Injection of Carriers in DFB Laser,” Stevens Institute of Technology, Physics Department, March 2015.
- Tao Yang, “All-optical frequency modulation of quantum cascade laser and its application on infrared spectroscopy,” Stevens Institute of Technology, Physics Department, May 2014.
- Fangming He, “Physical Security in Wireless Communications,” Stevens Institute of Technology, Electrical and Computer Engineering Department, May, 2012.
- Vinod Challa, “Vibration Energy Harvesting for Low Power and Wireless Applications,” Stevens Institute of Technology, Mechanical Engineering Department, May, 2011.
- Brian Borowski, “Application of Channel Estimation to Underwater Acoustic Communication,” Stevens Institute of Technology, Computer Science Department, June, 2010.
- Gang Chen, "All-Optical Modulation of Quantum Structure/Devices," Stevens Institute of Technology, Physics Department, May 2010.

Conference Papers

- He, F., Man, H., Kivanc, D., McNair, B., “EPSON: Enhanced Physical Security in OFDM Networks,” Proc. ICC 2009, Dresden, Germany, June 2009.
- Patel, S.; Cimini Jr, L.J.; McNair, B., “Comparison of frequency offset estimation techniques for burst OFDM,” *Proc. IEEE Vehicular Technology Conference VTC2002*, Birmingham, AL, May, 2002.
- Cimini, L., Leung, K., McNair, B., Winters, J. "Outdoor IEEE 802.11b Cellular Networks: MAC Protocol Design and Performance," *Proc. ICC 2002*, New York, NY, April 2002
- Clark, M., Leung, K., McNair, B., Kostic, Z., "Outdoor IEEE 802.11b Cellular Networks: Radio Link Performance", *Proc. ICC 2002*, New York, NY, April 2002.
- McNair, B., “Software Radio – the Commercial Perspective,” *Proc. IEEE Sarnoff Symposium*, Princeton, NJ, March 2002.
- Zou, H., Daneshard, B., McNair, B., "An Integrated OFDM Receiver for High-Speed Mobile Data Communications," *Proc. IEEE Globecom 2001*, San Antonio, TX, Oct. 2001.
- McNair, B., "Future Directions for Wireless Communications," *Supercomm2001*, Atlanta, GA, June, 2001

Conference Papers (continued)

- Cimini, L., McNair, B, "OFDM for High Data Rate, High-Mobility, Wide-Area Wireless Communications," *Proc. IEEE Sarnoff Symposium*, Princeton, NJ, March, 2001.
- Cimini, L., McNair, B, Sollenberger, N., "Implementation of an Experimental 384 kb/s Radio Link for High-Speed Internet Access," *Proc. IEEE Vehicular Technology Conference VTC2000*, Boston, MA, September, 2000.
- Cimini, L., McNair, B, Sollenberger, N., "Performance of an Experimental 384 kb/s 1900 MHz Radio Link In a Wide-Area High-Mobility Environment," *Proc. IEEE Vehicular Technology Conference VTC2000*, Boston, MA, September, 2000.
- Takamura, K.; Kunihiro, T.; Yamaura, T.; Fujita, E.; Anderson, G.; Chibane, C.; Feinberg, P.; Sollenberger, N.; McNair, B.; Mielcarek, E., "Field trial results of a band hopping OFDM system,' *Proc. IEEE Vehicular Technology Conference VTC99-Fall*, 1999. Amsterdam, the Netherlands, September 1999.
- McNair, B., Cimini, L., Sollenberger, N., "A Robust Timing and Frequency Offset Estimation Scheme for Orthogonal Frequency Division Multiplexing (OFDM) Systems," *Proc. IEEE Vehicular Technology Conference, VTC99*, Houston, TX, May 1999.
- McNair, B., Gupta, S., Kostic, Z., Sollenberger, N., "Experimental Results for Extensions to the IS-136 TDM Standard Based on Higher Level Modulation, Coherent Detection, and Equal Gain Antenna Combining," *Proc. IEEE Vehicular Technology Conference, VTC99*, Houston, TX, May 1999.
- Kostic, Z., McNair, B., Sollenberger N., "Experimental Performance Results of an Indoor Wireless Extension of IS-136 Based on pi/8 D8PSK, Coded Modulation, and Antenna Diversity," *Proc. IEEE Vehicular Technology Conference, VTC98*, Ottawa, Canada, May 1998.
- McNair, B., "The Effectiveness of Preselection Diversity for Indoor Wireless Systems," Proc. Int. Conf. on Universal Personal Communications, San Diego, CA, Oct. 1997.

Invited talks

- "Adventures in On-Line Education," Tsinghua University Webinar: Showcasing Online Course Designs, Online Teaching Guidance Expert Group, International Center for Engineering Educations (ICEE) – The United Nations Educational, Scientific and Cultural Organization (UNESCO), April 27, 2020.
- "Providing Structure, Motivation and Process in Security Education," Stevens/NIKSUN Workshop on Innovations in Cyber Security Research, Education and Training, Hoboken, NJ, March 2015
- "Wireless Security Panel," IEEE/AFCEA Fort Monmouth Annual Information Technology Forum and Expo, April 2005.

Invited talks (continued)

- "Of What Use is Wireless Multimedia Without Security," "What's Next in Multimedia Panel," 14th Annual Wireless and Optical Communications Conference, April 2005.
- "Is Wireless Security an Oxymoron?" IEEE Princeton/Central NJ Communications and Consumer Electronics and Computer Science Chapters, December, 2003.

Other Publications

- McNair, B., "Automatic Repeater Offsets," *73 Magazine,* November 1978, pp. 82-86.
- McNair, B, Williman, G., "Digital Keyboard Entry System," *Ham Radio,* Volume 11, Number 9, September, 1978, pp. 92-97.
- McNair, B., "A Digital Display for Amateur Radio Communications Equipment," *Ham Radio,* Volume 9, Number 9, September 1976, pp. 16-25.
- MIL-STD-188-114, "Electrical Characteristics of Digital Interface Circuits," Department of Defense Interface Standard, 24 March 1976

- Graduate:
  - EE/CpE-517 - Digital and Computer Systems Architecture (on-campus)
  - EE/TM/NIS-584 – Wireless System Security (on-campus and on-line)
  - EE-585/PEP-685/MT-685 – Physical Design of Wireless Communications (on-campus and on-line)
  - NiS/CpE-691 – Information Systems Security (on-campus and on-line)
  - EE/CpE-810A - Special Topics in EE/CpE - Digital and Computer Systems Architecture (on-campus)

- Undergraduate (on-campus):
  - E-232 – Design IV
  - BME-322 – Biomedical Design VI
  - EE/CpE-322 – ECE Design VI
  - EE/CpE-345 – Modeling and Simulation
  - CpE-358/CS-381 –Switching Theory and Logical Design
  - EE-359 – Electronic Circuits
  - EE/CpE-423; EE/CpE-424 – Senior Design
  - CpE-450 – Real-time Embedded Systems

Short Courses

- “Electronics and Computers,” preparation course for Fundamentals of Engineering/Professional Engineering license
  Stevens Institute of Technology
- "Digital Signal Processing - Principles, Architecture, and System Applications"
  - *Organizational Effectiveness Institute (originally Johns Hopkins University's continuing education program)*,
- "Wireless Digital Communications Systems: Components, Specifications, Test and Evaluation"
  - *Organizational Effectiveness Institute*
- "Security in Digital Communications Networks"
  - *Bell Labs Architecture Area Adopt a University Program: Grambling State University*
  - *Monmouth University*
- “Digital Telephony"
  - *Monmouth University*
  - *Fort Monmouth Education Center*
  - *Berlin (F.R.G.) Continuing Engineering Education Program*
- "Digital Communications & Applications"
  - *University of Maryland*
  - *Fort Monmouth Education Center*
  - *UCLA Extension University*
- "Digital Communications," presented with Allen Gersho, N.S. Jayant and David Falconer.
  - *George Washington University*
- "Data Communications for the System Designer"
  - *Bell Labs In-Hours Continuing Education Program*

Expert witness, patent consulting experience

- Authentication technology
- Bluetooth, WiFi, ZigBee, and other local/personal area wireless networking
- Cellular systems
- Communications networking
- Digital clock control for power management in SoCs
- Digital Rights Management
- Digital Subscriber Loop (DSL) technology
- Electronic technology
- Embedded systems
- Geolocation technology
- Industrial process control software
- Localization services
- Messaging systems
- Multifactor Authentication
- Peer-to-peer and client-server networks
- Secure voice communications
- Signal processing
- Smart cards and magnetic stripe cards for payment systems
- Software/firmware code analysis (C, VHDL)
- Software trade secrets
- Television and television tuner technology
- Trusted systems
- User and system authentication technology
- Video messaging
- Video scrambling and pay-per-view systems
- Voice processing and voice response systems
- Wireless communications and networking – particularly PHY and MAC layers

Law firms supported

- Avant Law, Overland Park, KS (Hissan Anis)
- Baker & McKenzie, Dallas, TX (William McSpadden)
- Bradley, Birmingham, AL (Paul Sykes, Benn Wilson, Jake Gipson)
- Bragalone-Conroy, Dallas, TX (Nick Kliewer, Daniel Olejko, Stephanie Wood)
- Cantor-Colburn, Hartford, CT (Steve Coyle)
- Carella-Byrne (Donald Ecklund)
- Clark-Hill, Pittsburgh, PA, (J. Alexander Hershey)
- Desmarias, New York, NY (Kerri-Ann Leembeck)
- DLA Piper, Austin, TX, San Francisco, CA and San Diego, CA (Brian Erickson, Gerald Sekimura, Kevin Hamilton)
- Fox Rothschild, Lawrenceville, NJ (Gerard Norton)
- Gibbons-Deldeo, Newark, NJ (Michael Cukor, Sheila McShane, Vin McGeary, Erich Falke, Chris Strate)
- Greenberg-Traurig, McLean, VA (Andrew Sommer)
- Hogan-Lovells, Denver, CO (Matt Rozier, Aaron Oakley, Lucky Vidmar)
- Jones-Day, New York, NY (Tom Gianetti)
- Latimer, LLP, Oakhurst, NJ (Brian Latimer)
- Merchant-Gould, Atlanta, GA (George Jenson)
- Morrison-Foerster, San Diego, CA (Christian Andreau-von Eaw)
- Oblon Spivak, Arlington, VA (Robert Mattson, Scott McKeown)
- Orrick, Herrington and Sutcliffe, Silicon Valley (Jason Angell)
- Quattlebaum, Grooms, Tull & Burrow, Little Rock, AR (Steve Quattlebaum)
- Quinn-Emanuel, New York, NY (Marc Kaplan)
- Ropes & Gray, Washington, DC, (Scott McKeown, Victor Cheung)
- Sabety & Associates (Ted Sabety)
- Sidley Austin, Chicago, IL, Washington, D.C. (Doug Lewis, Rick Cederoth, Mike Franzinger)
- Steptoe & Johnson, Washington, D.C. (Kate Cappaert, Brian Johnson)
- Carr & Waddoups, Salt Lake City, UT (Trent Waddoups)
- Unified Patents, Washington, DC (Michelle Callaghan, Ashraf Fawzy, Jung Hahm, Roshan Mansinghani, Jessica Marks, Jordan Rossen, David Seastrunck)
- Wilson, Sonsini, Goodrich & Rosati, Palo Alto, CA, Seattle, WA (Matthew Argenti, Quincy Lu)
- White Case, Washington, DC, New York, NY (David Tennant, Grace Wang)
- Wisser and Weinstein, West Hartford, CT (Kerry Wisser)
- Woodcock and Washburn, Philadelphia, PA (Michael Bonella)

Exhibit B

Bruce McNair's declarations, expert reports, depositions and testimony

Case	Technology	Supporting	Law firm	Attorney	Expert report/ declaration	Deposed	Testified
Avocent Redmond Corp., formerly known as Apex, Inc. v. **Raritan Computer, Inc**.; Case 1:01-cv-04435-PKC, United States District Court, Southern District of New York.	Keyboard-video-monitor (KVM) switching systems - patent dispute	Defendant	Gibbons-Deldeo, Newark, NJ	Sheila McShane Vincent McGeary	Apr 3, 2005	Apr 5, 2005	No
Marvell International, Ltd. v. Agere Systems, Arbitration No. 50 133 T 00392 06, American Arbitration Association, International Centre for Dispute Resolution, NY, NY	Physical level of WiFi network implementation - licensing issue	Plaintiff	Orrick-Herrington, Silicon Valley, CA	Jason Angell Jan Ellard	Mar 16, 2007	Mar 24, 2007	Mar 27, 2007
Cellularvision Technology & Telecommunications, L.P. v. **Alltel Corporation**, et. al., Case no. 07-CV-00444-JMM, United States District Court, Eastern District of Arkansas, Western Division.	video messaging in cellular/wireless networks - patent dispute	Defendant	Baker-McKenzie, Dallas, TX; Quattlebaum-Grooms, Little Rock, AR	Bill McSpadden Steve Quattlebaum	June 6, 2008	June 19, 2008	No
American Patent Development Corporation, LLC v. Movielink, LLC, Civil Action 07-605-JJF, United States District Court, District of Delaware.	Network distribution of movies and video content; digital rights management - patent dispute	Plaintiff	Sabety & Associates, New York, NY	Ted Sabety	Dec 12, 2008 Apr 17, 2009	Feb 13, 2009 May 1, 2009	No
Yangaroo, Inc. v. **Destiny Media Technologies, Inc.**, et. al., Case 1 :09-cv-00462-WCG, United States District Court, Eastern Division of Wisconsin, Green Bay Division	Network distribution of music; digital rights management - patent dispute	Defendant	Sabety & Associates, New York, NY	Ted Sabety	Jan 15, 2010	Jan 29, 2010	No
Inncom International, Inc. v. Control4 Corporation, Case 3:09-cv-00649, United States District Court, District of Connecticut	Intelligent HVAC and room security system - patent dispute	Plaintiff	Cantor-Colburn, Hartford, CT	Bill Cass, Steve Coyle	Mar 10, 2010	No	No
Wes-Garde Components Group, Inc. v. Carling Technologies, Inc, Case HHDCV09 5028121S	Electrical power switching and control systems – licensing issue	Plantiff	Weinstein & Wisser, West Hartford, CT	Kerry Wisser	Jan 28, 2011	Sept 16, 2011	No
Motorola vs. **Microsoft**, ITC Investigation 337-TA-752 – "Regarding Certain Gaming and Entertainment Systems"	Wireless networks - patent dispute	Respondent	Sidley Austin, Chicago, IL	Douglas Lewis Richard Cederoth Michael Franzinger	July 1, 2011 July 15, 2011	July 29, 2011	Jan 12, 2012
Avocent Redmond Corp. v. **Raritan Americas, Inc.**, Case 10-CV-6100, United States District Court, Southern District of New York.	Keyboard-video-monitor (KVM) switching systems	Defendant	Gibbons-Deldeo, Newark, NJ	Vincent McGeary Erich Falke Michael Cukor	Nov 28, 2011 Jan 4, 2012	Jan 27, 2012	Sept 25, 2012

Case	Technology	Supporting	Law firm	Attorney	Expert report/ declaration	Deposed	Testified
	- patent dispute			Christopher Strate			
Eastman Kodak Company vs, **Kyocera Corporation**, Civil Action No. 10-cv-6334-CJS, Western District of New York	Digital camera and cellular handset technology – licensing issue	Defendant	Morrison & Foerster San Diego, CA	Christian Andreau-von Eaw	May 11, 2012	June 28, 2012	No
USPTO IPR Lone Star WiFi LLC vs. **Starwood Hotels, Inc**. Case # 612CV957, Eastern District of Texas	Wireless networks with prioritized access - IPR	Petitioner	Oblon-Spivak Arlington, VA	Scott McKeown	Oct 31, 2013	No	No
USPTO IPR: **Cisco** vs. Rockstar Technologies IPR2014-01220	Multimedia distribution system with user and network controls - IPR	Petitioner	Oblon-Spivak Arlington, VA	Chris Ricciuti	July 30, 2014	No	No
Cresta Technology Corp. vs. **Silicon Labs**: ITC Investigation 337-TA-910 – "Regarding Certain Television Sets"	Digital TV tuner technology - patent dispute	Respondent	DLA Piper Austin, TX; San Francisco, CA; San Diego, CA	Brian Erickson Gerry Sekimura Kevin Hamilton	Aug 25, 2014 Sep 16. 2014	Sep 29, 2014	Dec 3, 2014
USPTO IPR: Oticon vs. **GN ReSound** IPR2015-00103 and IPR2015-00104	Hearing assistance devices with wireless access via shared earpiece cord - IPR	Petitioner	Oblon-Spivak Arlington, VA	Victor Cheung Scott McKeown	Sept 9, 2014	July 21, 2015	No
Ericsson vs. **Apple**, 2:15-cv-290, Eastern District of Texas, Marshall Division.	Location services - patent dispute	Defendant	Hogan-Lovells Denver, CO	Matt Rozier	Nov 11, 2015	No	No
USPTO IPR: **Sony** vs. Cellular Communications Equipment IPR2016-00367	Emergency wireless alerting system - IPR	Petitioner	Oblon Arlington, VA	Victor Cheung Scott McKeown	Dec 18, 2015	No	No
USPTO IPR: **Alcatel-Lucent** vs. Adaptix IPR2016-01030	Multi-carrier (OFDM) wireless communications - IPR	Petitioner	Quinn Emanuel New York	Marc Kaplan	May 11, 2016	No	No
USPTO IPR: **Securus Technologies** vs. Global Tel*Link IPR2016-01115	User authentication in telecommunications management system - IPR	Petitioner	Bragalone Conroy Dallas, TX	Daniel Olejko Nick Kliewer Stephaine Wood	May 31, 2016	No	No
Process Control Corporation vs. **Conair Group, Inc., and Alan Landers,** Civil Action No. 1:13-cv-04274-ELR (N.D. Ga.)	Industrial process control software - trade secrets dispute	Defendant	ClarkHill Pittsburgh, PA	J. Alexander Hershey	May 31, 2016 June 30, 2016	Aug 18, 2016	No
USPTO IPR: Arris International vs. **Sony**	Device	Respondent	Oblon	Victor Cheung	July 8, 2016	No	No

Case	Technology	Supporting	Law firm	Attorney	Expert report/ declaration	Deposed	Testified
IPR2016-00827	authentication in video control system - IPR		Arlington, VA	Scott McKeown			
USPTO Ex Parte reexam: **Cornell Technical Licensing**	CSMA and multipacket reception wireless systems	Petitioner	Oblon Arlington, VA	Victor Cheung Scott McKeown	Feb 24, 2017	No	No
Straight Path IP Group, Inc v. **Apple, Inc**. Case No. 3:16-cv-03582 Northern District of CA	VoIP networking - patent dispute	Defendant	Hogan-Lovells Denver, CO	Matt Rozier Aaron Oakley Lucky Vidmar	April 7, 2017 Aug 31, 2017 Sep 21, 2017 Oct 19, 2017	Apr 12, 2017 Sep 28, 2017	No
USPTO PGR: Supercell OY v. **Gree, Inc.** PGR2018-00064	Digital and microprocessor devices - IPR	Respondent	Ropes-Gray, Washington, DC	Victor Cheung Scott McKeown	August 16, 2018	No	No
USPTO IPR: **Unified Patents** vs. Ambush Interactive IPR2019-00495	Speech processing, embedded systems, remote control - IPR	Petitioner	Ropes-Gray, Washington, DC	Victor Cheung Scott McKeown	December 27, 2018	No	No
USPTO IPR: **Unified Patents** vs. Universal Cipher IPR2019-00498	Encryption techniques for password authentication - IPR	Petitioner	Ropes-Gray, Washington, DC	Victor Cheung Scott McKeown	December 30, 2018	No	No
USPTO IPR: **Unified Patents** vs. Portal Communications IPR2019-00513	Web-enabled speech processing and location services - IPR	Petitioner	Ropes-Gray, Washington, DC	Victor Cheung Scott McKeown	December 31, 2018	No	No
Broadcom vs. Renesas, et. al., ITC Investigation 337-TA-1119 – "Regarding Certain Infotainment Systems"	Clock control in SoCs - patent dispute	Petitioner	Steptoe & Johnson, Washington, DC	Kate Cappaert Brian Johnson	March 4, 2019 March 19, 2019	March 27, 2019	June 3, 2019 June 6, 2019
USPTO IPR: **Square Inc.** vs. Anywhere Commerce/4361423 Canada, Inc. IPR2019-01625, IPR2019-01626, IPR2019-01627, IPR2019-01628, IPR2019-01629, IPR2019-01630	Smart card and magnetic stripe reader and processing for financial payment systems - IPR	Petitioner	Ropes-Gray, Washington, DC	Victor Cheung Scott McKeown	September 30, 2019 September 30, 2019 September 30 2019 September 30, 2019 September 30 2019 September 30 2019 October 14, 2020 October 14, 2020 October 14, 2020	No	No
IPR2019-01649, IPR2019-01650			White-Case, New York, NY	David Tennant Grace Wang	September 30, 2019 September 30, 2019 October 14, 2020		

Case	Technology	Supporting	Law firm	Attorney	Expert report/ declaration	Deposed	Testified
					October 14, 2020		
USPTO IPR **Unified Patents** vs. Honeyman Cipher Solutions. IPR2020-00213	Software tamper prevention and detection via encryption - IPR	Petitioner	Unified Patents, Washington, DC	Ashraf Fawzy David Seastrunck	December 13, 2019	No	No
Michalski vs. **Michalski**, Monmouth County Court (NJ), FM-13-1543-16-C	Cell phone usage, geolocation, propagation and characteristics – civil litigation	Defendant	Latimer, LLP Oakhurst, NJ	Brian Latimer	December 15, 2019	No	No
USPTO IPR: **Unified Patents** vs. Universal Cipher IPR2019-00498	Encryption techniques for password authentication - IPR	Petitioner	Unified Patents	Jung Hahm Roshan Mansinghani	January 20, 2020	No	No
USPTO IPR Renesas vs. **Broadcom**, IPR2019-01039	Clock control in SoCs - IPR	Respondant	Steptoe & Johnson, Washington DC	Brian Johnson	February 7, 2020	May 28, 2020 (virtual)	No
TQ Delta vs. **ADTRAN**, Case 14-cv-954-RGA & 15-cv-121-RGA, District of Delaware	DSL signaling and control - patent dispute	Defendant	Bradley Birmingham, AL	Benn Wilson	February 28, 2020 April 10, 2020 April 24, 2020 Sep 23, 2020 October 23, 2020 Nov 6. 2020 February 26, 2021	May 22, 2020 (virtual) Dec 22, 2020 (virtual)	No
USPTO IPR: **Unified Patents** vs. Portal Communications IPR2019-00513	Web-enabled speech processing and location services - IPR	Petitioner	Unified Patents, Washington, DC	Jessica Marks Roshan Mansinghani	April 8, 2020	No	No
USPTO IPR: **Unified Patents** vs. Optima Direct IPR2020-00784	Multifactor authentication - IPR	Petitioner	Greenberg-Traurig McLean, VA	Andrew Sommer	April 10, 2020	No	No
USPTO IPR **Unified Patents** vs. Voice Tech, IPR2020-01018	Mobile voice control of computer application - IPR	Petitioner	Unified Patents Washington, DC	Jordan Rossen Michelle Callaghan	June 5, 2020 June 28, 2021	No	No
Call vs. Chakra Lounge, **RMB, Inc**., Wasted Space, LLC, Shaman, Inc., C.H.U. Holdings, and Corbin Celotto, Case 190900552, Third Judicial District Court for Salt Lake City County, Utah	Geolocation – civil litigation	Defendant	Carr & Waddoups Salt Lake City, UT	Trent Waddoups	August 17, 2020	No	No
USPTO IPR **Mycroft** vs. Voice Tech, IPR2020-01739	Mobile voice control of computer	Petitioner	Avant Law, Overland Park, KS	Hissan Anis	October 1, 2020 October 20, 2021	No	No

Case	Technology	Supporting	Law firm	Attorney	Expert report/ declaration	Deposed	Testified
	application - IPR						
USPTO IPR **Unified Patents** vs. Karetek, IPR2020-01550	Multifactor authentication - IPR	Petitioner	Wilson, Sonsini, Goodrich, Rosati Palo Alto, CA Seattle, WA	Matthew Argenti Quincy Lu	October 1, 2020	No	No
Cellcast vs. **USDoJ/IBM**, Case 15-1307, US Court of Federal Claims	Emergency Alerting Systems	Defendant	Goodwin, NY, NY US DoJ, Washington, DC	Mark Abate Alexandra Valenti Calvin Wingfield Jaqueline Genovese Bova Philip Sternhell	September 14, 2021	Nov 12, 2021 (virtual)	No
USPTO IPR **Unified Patents** vs. Liberty Peak Ventures, IPR2022-0024	Financial transaction security/RFID	Petitioner	Unified Patents, Washington, DC	Michelle Aspen	October 21, 2021	No	No

As of 11/12/2021	Total	On behalf of Plaintiff/Complainant/Petitioner	On behalf of Defendant/Respondant
Expert reports/declarations	70	39	31
IPR/USPTO declarations	37	34	3
Depositions	20	6	14
Testimony	6	3	3